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E3 wherein said glass filaments deposited in said process in total comprise more than 40
% by weight of said glass filaments and said filaments of thermoplastic organic material
deposited in said process.--

REMARKS

Favorable reconsideration of this application, as presently amended, is respectfully requested.

Claims 1 and 5-14 are presently pending in this application, Claims 1 and 5-14 having been amended by the present amendment.

In the outstanding Office Action, Claims 1 and 5-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Francis (U.S. Patent 2,543,101) in view of O'Conner (U.S. Patent 4,800,113), and alternatively further in view of PCT WO 90/14457 (refer to WO '457 hereinafter).

Claims 1 and 5-14 have been amended to further clarify their claimed subject matter. Hence, these claim amendments are not believed to raise a question of new matter.

Briefly, conventional methods for the manufacture of a composite material suffer from a limited amount of reinforcing fibers which can be deposited during manufacturing process.¹ To improve this shortcoming and others, the present invention is directed to a method for continuously manufacturing a reinforced thermoplastic composite having a high glass fiber content. As disclosed in the non-limiting embodiments of Figures 1-3 and according to Claim 1 of the present invention, a method for continuously manufacturing a

¹ Specification, page 3, lines 8-13 and page 15, lines 7-11.

composite product includes depositing onto a moving conveyor two layers, one of the two layers being made of at least one of continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, and chopped threads, the one of the two layers including at least 80% by weight of intimately blended commingled threads containing glass filaments and filaments of thermoplastic organic material, and the other one of the two layers being a strip of fabric formed by glass threads including at least a portion of commingled threads containing glass filaments and filaments of thermoplastic organic material; transferring the two layers combined through a plurality of zones where the two layers are heated and cooled while being simultaneously compressed; and at least one of cutting up the two layers into a plurality of sheets and winding the two layers onto a rotating drum. According to Claim 1, the glass filaments deposited in the process in total comprise more than 40 % by weight of the glass filaments and the filaments of thermoplastic organic material deposited in the process.

By depositing the two layers containing glass threads and thermoplastic organic material as such, the method according to Claim 1 of the present invention makes it possible to continuously manufacture a composite material whose content of reinforce fibers is exceedingly high.² In addition, because of the glass threads contained in the continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, and chopped threads and the layer of a fabric strip formed by glass threads containing commingled threads of glass and thermoplastic filaments, lamination of the fabric strip and the continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, or

² Id. page 15, lines 7-11.

chopped threads readily promotes a high content of reinforcing fibers evenly throughout the composite product. As a result, the manufacturing method of the present invention allows to produce continuous composite products whose strength is equal or higher than those manufactured simply by increasing glass content.³

Francis discloses a method for manufacturing a composite product having a layer of prefabricated textile material and a layer of felt-like material.⁴ According to Francis, the product has a felt-like layer whose one surface is exposed and the other surface is securely anchored to a textile layer.⁵ However, Francis does not teach depositing onto a moving conveyor two layers, one of the two layers being made of at least one of continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, and chopped threads, the one of the two layers including at least 80% by weight of intimately blended commingled threads containing glass filaments and filaments of thermoplastic organic material, and the other one of the two layers being a strip of fabric formed by glass threads including at least a portion of commingled threads containing glass filaments and filaments of thermoplastic organic material, wherein the glass filaments deposited in the process in total comprise more than 40 % by weight of the glass filaments and the filaments of thermoplastic organic material deposited in the process. On the other hand, Francis discloses how to deposit and bond “non-adhesive fibers” onto a textile fabric by using “potentially adhesive fibers”, thereby making a felt-like product described above. As such, Francis discloses that a small proportion of the “potentially adhesive fibers”,

³ Id. lines 28-38.

⁴ Francis, column 1, lines 1-7.

⁵ Id.

e.g., thermoplastic material, be generally used in securely anchoring the “non-adhesive fibers”, e.g., spun glass, to the textile fabric.⁶ Also, Francis teaches to use a larger amount of the “potentially adhesive fibers” if a greater degree of strength or a closer bonding of the component fibers is desired.⁷ In other words, Francis does not teach how to increase the content of reinforcing fibers in a composite product, but teaches only how to bond the “non-adhesive fibers” onto a surface of a textile fabric in a continuous production of a felt-like product. Francis therefore does not suggest or disclose how to continuously manufacture a reinforced thermoplastic composite having a high glass fiber content. Accordingly, the specific process disclosed in Claim 1 is clearly distinguishable from Francis.

Applicants also wish to point out that although Francis generally discusses adjusting the ratio of the “potentially adhesive fibers” to obtain a desired product, Francis does not recognize a % wt. of glass fibers being a crucial parameter in obtaining an exceptionally durable reinforced composite material. MPEP 2144.05, citing *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977), states that “a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” As discussed above, Francis merely discusses the ratio of the “potentially adhesive fibers” in terms of securely anchoring the “non-adhesive fibers” onto the textile fabrics, but nowhere in Francis suggests or teaches a % wt. of glass fibers being a result effective variable in obtaining a recognized result in the present invention, i.e., an exceptionally durable reinforced composite material. On that ground, Applicants respectfully

⁶ Id. column 11, lines 8-27.

⁷ Id.

traverse the assertion in the outstanding Office Action that Francis teaches the depositing step recited in Claim 1.

O'Connor discloses a method of producing a composite product using co-mixed fibers either in the form of a fabric or in the form of a chopped strand mat. However, O'Connor does not teach depositing onto a moving conveyor two layers, one of the two layers being made of at least one of continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, and chopped threads, the one of the two layers including at least 80% by weight of intimately blended commingled threads containing glass filaments and filaments of thermoplastic organic material, and the other one of the two layers being a strip of fabric formed by glass threads including at least a portion of commingled threads containing glass filaments and of filaments of thermoplastic organic material, wherein the glass filaments deposited in the process in total comprise more than 40 % by weight of the glass filaments and the filaments of thermoplastic organic material deposited in the process. Instead, O'Connor merely teaches how to produce fiber reinforced thermoplastic articles from thermoplastic filaments and reinforcing fibers. To that end, the O'Connor method includes the steps of "intermingling" filaments of thermoplastic and continuous filaments of reinforcing fibers, weaving these filaments into a fabric, and heating the fabric.⁸ Although, by commingling the thermoplastic and reinforcing filaments, the O'Connor method teaches how to provide adequate contact between the thermoplastic and reinforcing filaments, O'Connor fails to teach not only the layer of a fabric strip formed by glass threads containing commingled threads of glass and thermoplastic filaments but also adequate contact between such a layer and the layer made of at least one of

⁸ O'Conner, columns 6-7.

the continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, and chopped threads consisting of the thermoplastic and reinforcing filaments. Furthermore, although the outstanding Office Action asserts that O'Conner teaches glass threads to be chopped in order to form a nonwoven matt or batting, O'Conner does not suggest glass threads in the continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, or chopped threads to be directly laminated with a fabric strip also formed partially by glass filaments. To maintain a rejection under 35 U.S.C. §103(a), there must be some motivation or suggestion in the applied references to select the components of an invention.⁹ Nevertheless, O'Conner does not suggest combining glass threads contained in the continuous threads deposited in a direction of movement of the moving conveyor, continuous threads deposited in a form of superposed loops, or chopped threads with a fabric strip formed by the glass threads wherein the glass threads are commingled threads consisting of glass and thermoplastic filaments for the purpose of increasing the content of reinforcing filaments in a composite material. The obviousness rejection in the Office Action therefore predicates its assertion upon impermissible hindsight of Applicants' invention as a guide. Accordingly, the specific process recited in Claim 1 is clearly distinguishable from O'Connor.

In addition, O'Conner neither describes nor suggests a process for continuously fabricating a composite whose rate of strengthening is greater than 40% by weight. A process for continuously manufacturing a composite product by associating glass threads and a

⁹ See In re Baird, 29 USPQ2d. 1550 (CAFC 1994); In re Jones, 21 USPQ2d. 1941 (CAFC 1992).

thermoplastic organic material in a filamentary state according to Claim 1 produces a continuous composite product which does not require any extra preliminary connecting or joining processes. Instead, a continuous composite product manufactured according to Claim 1 is ready to be cut, molded or deposited directly for its desired use, thereby permitting the composite product to take a very complex shape while maintaining the same reinforcement ratio throughout the composite product in its final form. Also, because the reinforcement and the thermoplastic organic material are firmly combined in this process, the composite product is very homogenous despite its high reinforcement ratio and a time for molding the composite product into its final shape is considerably reduced at the same time.

Following the same line of reasoning, WO '457 discloses a method for producing a fiber reinforced plastic material, but also fails to teach the depositing step, wherein the glass filaments deposited in the process in total comprise more than 40 % by weight of the glass filaments and the filaments of thermoplastic organic material deposited in the process as discussed above. The specific process recited in Claim 1 is therefore unambiguously distinguishable from WO '457 also.

Since none of Francis, O'Conner and WO '457 teaches the depositing step, wherein the glass filaments deposited in the process in total comprise more than 40 % by weight of the glass filaments and the filaments of thermoplastic organic material deposited in the process as recited in Claim 1, even the combined teachings of these cited references would not in any way obviate the specific process recited in Claim 1.


Similarly, since independent Claims 13 and 14 include a similarly distinctive feature as recited in Claim 1, namely, the depositing of the two layers as recited in Claim 1, Claims 13 and 14 are also distinguishable from Francis, O'Conner and PCT WO 90/14457.

For the foregoing reasons, Claims 1, 13 and 14 are believed to be allowable. Furthermore, because Claims 5-12 depend directly or indirectly from Claim 1 and contain limitations not taught by the references of record, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 5-12 are believed to be allowable as well.

In view of the amendments and discussions presented above, it is respectfully submitted that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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